جامعة الإسكندرية
ALEXANDRIA
UNIVERSITY

SDG1



Sustainable cities and Communities

2025-2026

Sustainable Development Goal 11 (SDG 11): Sustainable Cities and Communities

Sustainable Development Goal 11 (SDG 11), established by the United Nations, aims to make cities and human settlements inclusive, safe, resilient, and sustainable. It addresses urbanization, housing, transportation, environmental protection, disaster preparedness, public spaces, waste management, and sustainable urban planning.

For **Alexandria University**, SDG 11 represents an important opportunity to connect academic research, technological innovation, environmental management, and community engagement with the sustainable development of Alexandria, Egypt.

Alexandria is one of Egypt's most important coastal cities. Its urban development is influenced by population growth, traffic congestion, air pollution, coastal flooding, climate change, aging infrastructure, solid waste, and pressure on cultural heritage.

Alexandria University contributes to this goal through its Green University initiatives, sustainability-oriented infrastructure, scientific publications, heritage preservation activities, student engagement, and interdisciplinary research.

The university's SDG 11 report documents activities involving heritage exhibitions, green campus development, sustainable transportation concepts, energy efficiency, water conservation, and waste management. Its sustainability-oriented infrastructure report for 2024–2025 also identifies green building standards, rooftop plantations, and green roofing as contributions to SDG 11.





Sustainable Development Goal 11 is particularly important for Alexandria because the city faces interconnected environmental, social, economic, and infrastructural challenges.

Urbanization, population growth, transportation problems, air pollution, coastal flooding, climate change, waste generation, and pressure on water resources require integrated and long-term solutions.

Alexandria University has an important role in supporting these solutions through its Green University approach, sustainability-oriented infrastructure, cultural heritage activities, research publications, and engagement with the surrounding community.

The university's existing SDG 11 documentation demonstrates a foundation for further development in sustainable buildings, environmental management, transportation, waste reduction, and cultural preservation.

The Alexandria Green City Action Plan and the Strategic Urban Planning initiative until 2032 also provide opportunities for collaboration between the university, government, and international development organizations.

Ultimately, Alexandria University should strengthen its position as a research and innovation partner in transforming Alexandria into a more inclusive, environmentally responsible, technologically advanced, and climate-resilient city.

Achieving this objective requires continuous research, reliable data, effective policies, investment, community participation, and measurable performance indicators.
SDG 11 should therefore be considered not only an environmental objective but also a comprehensive framework for improving the quality of life of present and future generations in Alexandria.

SDG 11 and Alexandria

Cities are complex systems in which human activities, buildings, roads, transportation networks, natural resources, and environmental conditions interact.
Urban development can improve economic performance, accessibility, education, and public services. However, uncontrolled urbanization can also increase pollution, traffic congestion, housing problems, environmental degradation, and disaster risk.
Alexandria presents an important case study because of its geographical location along the Mediterranean Sea, its historical significance, its industrial and commercial activities, and its dense urban population.
The city's development requires an integrated approach that combines:

- Sustainable urban planning and land-use management.
- Affordable and safe housing.
- Efficient public transportation and road networks.
- Improved air quality and environmental monitoring.
- Sustainable water supply and wastewater treatment.
- Municipal solid waste management and recycling.
- Climate change adaptation and flood control.
- Earthquake preparedness and structural safety.
- Protection of cultural heritage and public spaces.
- Smart-city technologies and data-driven decision-making.

The Alexandria University sustainability platform explicitly identifies SDG 11 as one of the university's commitments toward improving the social, economic, and environmental well-being of the community.

Objectives

The main objectives of this report are:

- To evaluate the contribution of Alexandria University to SDG 11.
- To investigate the effects of urbanization on Alexandria's environment and communities.
- To examine transportation, traffic congestion, and air quality.
- To analyze climate-related risks, particularly coastal flooding and storms.
- To investigate sustainable housing, buildings, and urban infrastructure.
- To evaluate solid waste, wastewater, and water-resource management.

- To examine the application of smart-city technologies and artificial intelligence.
- To identify research opportunities for Alexandria University.
- To develop recommendations for sustainable urban development through 2030.

Methodology and Research Approach

This report adopts a qualitative, evidence-based case-study methodology.

The research approach combines:

- Literature review of sustainable urban development.
- Analysis of Alexandria University's published SDG 11 report.
- Review of the Alexandria Green City Action Plan.
- Examination of environmental and climate-related assessments.
- Comparative analysis of urban sustainability practices.
- Identification of research gaps and potential interventions.

The main research area is Alexandria Governorate, with Alexandria University considered both as an educational institution and as a contributor to local urban development.

Alexandria University's Contribution to SDG 11

Green University and Sustainable Infrastructure





Alexandria University has adopted a Green University approach to reduce the environmental impact of its buildings, campus activities, and transportation systems.

Its published Green University report identifies several sustainability priorities:

- Energy efficiency and climate change mitigation.
- Increasing green spaces and vegetation.
- Environmentally friendly transportation.
- Waste separation and recycling.
- Water conservation and wastewater treatment.
- Smart buildings and energy-monitoring systems.

The university report also proposes solar-powered lighting, rooftop solar panels, LED lighting, bicycle facilities, and campus buses. These measures are presented as part of its sustainability framework; proposed measures should not automatically be interpreted as fully implemented projects.

The 2024–2025 university sustainability report further identifies green building standards, daylighting, rooftop plantations, and green roofing as SDG 11 contributions.

Cultural Heritage and Sustainable Communities





Alexandria has a distinctive cultural and architectural identity. Its Greek-Roman history, historic buildings, waterfront, museums, and traditional urban areas represent important social and economic resources.

Alexandria University's SDG 11 report documents activities including:

- Conferences on cultural heritage.
- Handicrafts and heritage-product exhibitions.
- Student participation in traditional arts and crafts.
- Activities associated with the Saraya Al-Haqqania Holding Museum.
- Development and use of the university's digital library.

The 2022 handicrafts and heritage exhibition involved 200 university students and graduates and 20 external exhibitors, demonstrating the potential contribution of the university to cultural preservation, community participation, and economic opportunities.

Scientific Research and Urban Innovation

Alexandria University can support SDG 11 through interdisciplinary research involving engineering, architecture, environmental sciences, computer science, geography, economics, and social sciences. The university's SDG 11 report includes research on:

- Urban heat islands and building characteristics.
- Pedestrian microclimates in Alexandria's city centre.
- Urban spatial characteristics and human thermal comfort.
- Classification of local climate zones using urban databases.
- Sustainable architectural design.
- Environmental responses of vegetation to dust.

These research themes demonstrate how scientific investigation can inform urban planning, building design, environmental protection, and community well-being.

Solid Waste and Waste Management



Municipal solid waste is another important challenge for sustainable urban communities.
Increasing urban population and consumption create additional waste from residential areas, commercial activities, institutions, and industry.
Inappropriate waste disposal can result in:

- Soil and water pollution.
- Air pollution from waste burning.
- Greenhouse gas emissions.
- Public-health risks.
- Environmental damage to coastal areas.
- Increased pressure on municipal services.

Alexandria University's Green University report identifies waste separation into four categories: organic waste, plastics, metal cans, and paper.

Recommended interventions:

- Separate waste at its source.
- Increase recycling and composting.
- Improve municipal waste collection.
- Monitor waste-disposal facilities.
- Reduce single-use plastics.
- Introduce smart waste-monitoring systems.
- Encourage public participation in recycling programs.

Water Resources and Wastewater Treatment



Water is an essential resource for sustainable urban development.

Alexandria faces challenges associated with freshwater availability, increasing demand, aging infrastructure, wastewater management, and coastal saltwater intrusion.

The Green University report identifies water-saving equipment, maintenance of water supply networks, wastewater treatment, and reuse of treated wastewater for irrigation as sustainability measures.

The university's 2024–2025 SDG 6 reporting also covers water consumption, wastewater treatment, water reuse, and cooperation on water security.

Recommended approaches include:

- Improving water supply networks.
- Reducing leakage.
- Monitoring water quality.
- Expanding wastewater treatment.
- Reusing treated wastewater for suitable purposes.
- Protecting groundwater and coastal water resources.
- Introducing smart water meters and monitoring devices.

Housing, Buildings and Public Spaces



Housing is an essential component of SDG 11 because it directly influences the safety, health, accessibility, and quality of life of residents.

Important issues include residential density, building conditions, structural safety, affordability, accessibility, and the availability of public facilities.

Sustainable housing development should incorporate:

- Energy-efficient building materials.
- Natural lighting and ventilation.
- Green roofs and rooftop gardens.
- Improved structural safety.
- Water-saving technologies.
- Accessible public spaces.
- Appropriate building maintenance.
- Climate-responsive architectural design.

Alexandria University's research on pedestrian microclimates, urban heat islands, and green building approaches provides relevant scientific foundations for these interventions.

Digital Twin and Urban Simulation

A digital twin is a virtual representation of an urban area that can be used to investigate different development scenarios.

Alexandria University could develop digital models to simulate:

- Urban growth.
- Traffic-flow changes.
- Coastal flooding.
- Stormwater drainage performance.
- Building energy efficiency.
- Land-use transformation.
- Environmental pollution.

Such models could support future urban planning and investment decisions.

Relationship Between SDG 11 and Other Sustainable Development Goals

SDG 11 is interconnected with several other Sustainable Development Goals.

SDG	Relationship with SDG 11
SDG 3 – Good Health	Reducing air pollution, accidents and environmental health risks
SDG 6 – Clean Water	Improving water supply and wastewater treatment

SDG 7 – Clean Energy	Increasing renewable energy and energy efficiency
SDG 9 – Infrastructure	Developing resilient and sustainable infrastructure
SDG 12 – Responsible Consumption	Recycling and sustainable waste management
SDG 13 – Climate Action	Reducing climate risks and improving resilience
SDG 14 – Life Below Water	Protecting Mediterranean marine ecosystems
SDG 15 – Life on Land	Protecting vegetation and urban ecosystems
SDG 17 – Partnerships	Promoting research and cooperation

For Alexandria University, these relationships provide an opportunity to integrate research and practical interventions across different academic disciplines.

Proposed Performance Indicators and Evaluation

To evaluate progress toward SDG 11, Alexandria University should establish measurable indicators and monitor them over time.

Area	Proposed performance indicator
Housing	Percentage of residents in adequate housing
Urban planning	Percentage of urban area covered by integrated plans
Transportation	Public transport accessibility
Traffic	Average travel time
Air quality	Annual average PM2.5 concentration
Green spaces	Green space per capita
Waste	Municipal waste recycling rate
Water	Water losses and wastewater reuse rate
Climate	Population exposed to flood risks
Disaster management	Percentage of critical buildings assessed
Heritage	Number of heritage sites protected

Smart cities	Number of operational urban monitoring systems
Public participation	Community participation in urban planning

These are proposed monitoring indicators, not measured results for Alexandria University or the governorate.

Main Challenges and Research Gaps

Despite existing initiatives, several challenges require further investigation.

Challenge	Research gap	Proposed intervention
Urban growth	Insufficient integrated spatial monitoring	GIS-based urban growth models
Traffic congestion	Limited integrated traffic information	AI traffic prediction
Air pollution	Need for more detailed spatial measurements	IoT monitoring network
Coastal flooding	Uncertainty in future exposure	Compound flood simulation
Earthquake risk	Need for updated structural assessments	Seismic vulnerability studies
Waste management	Need for reliable waste-flow data	Smart waste-management systems
Water resources	Infrastructure losses and water scarcity	Smart water management
Housing	Uneven residential conditions	Housing surveys and evaluation
Green spaces	Uneven spatial distribution	Urban vegetation mapping
Cultural heritage	Environmental and structural vulnerability	Heritage risk assessment

An additional challenge is the integration of information from different organizations. Effective sustainable urban planning requires cooperation among Alexandria University, Alexandria Governorate, municipal authorities, environmental agencies, transportation organizations, private-sector institutions, and local communities.

Recommendations for Alexandria University

Based on the analysis, the following recommendations are proposed.

Research and education

- Establish an interdisciplinary SDG 11 research program.
- Encourage postgraduate research on sustainable urban development.

- Develop GIS and remote-sensing applications for Alexandria.
- Promote AI-based environmental prediction and risk assessment.
- Encourage collaboration between engineering, architecture, environmental sciences, and social sciences.

Campus sustainability

- Expand green buildings and rooftop vegetation.
- Improve renewable energy utilization.
- Increase campus recycling and composting.
- Improve water conservation and wastewater reuse.
- Encourage walking, cycling, and shared transportation.

Community and government partnerships

- Cooperate with Alexandria Governorate on sustainable urban planning.
- Develop environmental education programs for local residents.
- Organize surveys and community consultations.
- Support cultural heritage protection.
- Participate in coastal resilience and disaster-preparedness projects.

Smart-city development

- Establish an urban environmental monitoring platform.
- Develop real-time traffic and air-quality monitoring.
- Apply machine-learning techniques to predict urban risks.
- Develop digital maps of vulnerable residential areas.
- Create a university-supported SDG 11 database to monitor urban sustainability indicators.

Alexandria University events related to SDG 11 (2024–2025)

SDG 11 – Sustainable Cities and Communities aims to make cities and human settlements inclusive, safe, resilient, and sustainable.

The following events and initiatives are relevant to SDG 11 during the 2024–2025 period.



Inauguration of the Fab Lab for Reusing Plastic (PECA)

27 May 2024

- Organized by: Faculty of Engineering, Alexandria University.
- Focus: Plastic recycling, circular economy, and sustainable production.
- SDG 11 relevance: Promotes cleaner communities and more sustainable waste-management practices.



World Cities Day Celebration

1 November 2024

- Organized by: Alexandria Governorate, with participation from Alexandria University.
- Location: Bibliotheca Alexandrina.
- Focus: Urban development, smart cities, and sustainable urbanization.
- SDG 11 relevance: Directly addresses sustainable urban development and resilient cities.



Empowering Communities for Sustainable Urban Transformation: Integrating Local Action with Urban Acupuncture

5 November 2024

- Associated institution: Alexandria University.
- Event: 12th World Urban Forum (WUF12), Cairo.
- Focus: Community participation, urban acupuncture, healthier cities, and local urban-development interventions.
- SDG 11 relevance: Encourages inclusive and community-led urban planning.



21st International Scientific Conference – Global Challenges and Achieving Business Sustainability

13 July 2024

- Organized by: Faculty of Business, Alexandria University.
- Focus: Business sustainability, business incubators, and waste-recycling plants.
- SDG 11 relevance: Supports sustainable economic practices and resource-efficient communities.



Flow and Foresight Workshop – Climate Change

18 April 2025

- Organized by: Faculty of Engineering, Alexandria University, in collaboration with the University of Toulon and Barcelona Advanced Computing Centre.
- Location: Faculty of Engineering, Bibliotheca Alexandrina, and French Cultural Institute.
- Focus: Climate change, hydrodynamic processes, and marine flooding hazards.
- SDG 11 relevance: Strengthening Alexandria's resilience to climate-related urban and coastal risks.



Sustainable Development Seminar and Forum

23 March 2025

- Organized by: Faculty of Medicine, Alexandria University.
- Location: Grand Hall, University Conference Center.
- Focus: Sustainable development.
- SDG 11 relevance: Relevant to sustainable community development, although the published announcement does not specify SDG 11 as its primary focus.

Other SDG 11-related university activities during 2024–2025

Initiative	Relevance to SDG 11
Green building standards	Sustainable university buildings
Rooftop plantations	Urban greenery
Green roofing initiatives	Sustainable infrastructure
Daylighting in buildings	Energy-efficient urban infrastructure
Biodiversity-friendly landscaping	Healthy and sustainable environments

Summary table

Date	Event	SDG 11 connection
27 May 2024	PECA Fab Lab inauguration	Recycling and circular economy
13 July 2024	21st International Scientific Conference	Business and resource sustainability
1 November 2024	World Cities Day	Sustainable urbanization
5 November 2024	WUF12 – Urban Acupuncture session	Inclusive urban planning
23 March 2025	Sustainable Development Seminar	Sustainable communities
18 April 2025	Flow and Foresight Workshop	Urban and coastal resilience